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TMDLs for Mercury in Selected Subsegments in the Pearl River Basin, Louisiana

(090101, 090102, 090103, 090105, 090106, 090107, 090201, 090202-05126, 090203, 090204, 090205, 090206, 090207, 090207-5112, 090501)

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EXECUTIVE SUMMARY

Section 303(d) of the Clean Water Act and the U.S. Environmental Protection Agency's (EPA) Water Quality Planning and Management Regulations (Title 40 of the *Code of Federal Regulations* [CFR] Part 130) require states to develop Total Maximum Daily Loads (TMDLs) for impaired waterbodies. A TMDL establishes the amount of a pollutant that a waterbody can assimilate without exceeding the water quality standard for that pollutant. TMDLs provide the scientific basis for a state to establish water quality-based controls to reduce pollution from both point and nonpoint sources to restore and maintain the quality of the state's water resources (USEPA 1991).

A TMDL for a given pollutant and waterbody is composed of the sum of individual wasteload allocations (WLAs) for point sources and load allocations (LAs) for nonpoint sources and natural background levels. In addition, the TMDL must include an implicit or explicit margin of safety (MOS) to account for the uncertainty in the relationship between pollutant loads and the quality of the receiving waterbody. The TMDL components are illustrated using the following equation:

$$TMDL = \sum WLAs + \sum LAs + MOS$$

The study area for this TMDL includes 15 Pearl River Basin subsegments. The Pearl River flows along the border of Louisiana and Mississippi. It originates in Mississippi at the confluence of Nanawaya and Tallahaga creeks and flows southerly for almost 500 miles. It has a drainage area of almost 9,000 square miles. In the TMDL study area, the largest percentage of area is wetland, followed by forest, shrubland, and agriculture.

The Louisiana Department of Environmental Quality (LDEQ) included 15 Pearl River Basin subsegments on the state's 2004 section 303(d) list of impaired waterbodies. The subsegments are listed for mercury impairments. The impaired designated uses for the subsegments (Table ES-1) are primary and secondary contact recreation (PCR and SCR), fish and wildlife propagation (FWP), and outstanding natural resource water (ONR). The subsegments are characterized as fully supporting the designated uses (F), not supporting (N), insufficient data (I), or not assessed (X).

The numeric water quality criteria that were used to calculate the total allowable pollutant loads are a Louisiana fish tissue mercury action level of 0.5 ppm (mg/kg) and a water column measurement of 12 ng/L.

In TMDL development, allowable loadings from all pollutant sources that cumulatively amount to no more than the TMDL must be established, thereby providing the basis for establishing water quality-based controls. WLAs were assigned to permitted point source discharges. The LAs include background loadings and human-induced nonpoint sources. An implicit MOS based on conservative assumptions was used in this TMDL. Percent reductions ranged from zero to 64 percent. Table ES-2 presents a summary of the TMDLs for the subsegments addressed in this report.

Table ES-1. Section 303(d) listing for subsegments included in this report

Sub-segment	Subsegment name	Subsegment description	Designated use			
			PCR	SCR	FWP	ONR
090101	Pearl River	Mississippi state line to Pearl River Navigation Canal	N	F	N	
090102	East Pearl River	Holmes Bayou to I-10	F	F	N	
090103	East Pearl River	From I-10 to Lake Borgne	F	F	N	
090105	Pearl River Navigation Canal	Pools Bluff to Lock No. 3	F	F	N	
090106	Holmes Bayou	Pearl River to West Pearl River	F	F	N	N
090107	Pearl River	Pearl River Navigation Canal to Holmes Bayou	F	F	N	
090201	West Pearl River	Headwaters to Holmes Bayou	F	F	N	N
090202-5126	Morgan River	Porters River to West Pearl River	X	X	N	X
090203	Bogue Chitto	Pearl River Navigation Canal to Wilson Slough	F	F	N	
090204	Pearl River Navigation Canal	Below Lock No.3	F	F	N	
090205	Wilson Slough	Bogue Chitto to West Pearl River	I	I	N	I
090206	Bradley Slough	Bogue Chitto to West Pearl River	I	I	N	I
090207	Middle River and West Middle River	West Pearl River to Little Lake	F	F	N	
090207-5112	Morgan Bayou	Headwaters near I-10 to Middle River			N	
090501	Bogue Chitto	Mississippi state line to Pearl River Navigation Canal	F	F	N	N

Hurricane Katrina made landfall on Monday, August 29, 2005, as a Category 4 hurricane. The storm brought heavy winds and rain to southeast Louisiana. Floodwaters breached several levees, flooding large areas of coastal Louisiana. The hurricane caused a change in sedimentation and water quality in southern Louisiana.

Several federal and state agencies, including EPA and LDEQ, are engaged in collecting environmental data and assessing the recovery of the Gulf of Mexico waters. The proposed TMDLs in this report were developed on the basis of pre- and post-hurricane conditions. Therefore, some post-hurricane conditions and other factors could delay implementation of these proposed TMDLs, render some proposed TMDLs obsolete, or require modifications of the TMDLs. Hurricane effects might be a valid justification for some TMDL modification; however, any deviation from the TMDLs should be justified using site-specific data or information.

This TMDL report indicates that current mercury loadings throughout the project study area are primarily from nonpoint sources. Consequently, significant reductions in atmospheric deposition within and outside the study area will be necessary. EPA expects that a combination of ongoing and future activities under the Clean Air Act will achieve reductions in air deposition of mercury that will enable progress toward achieving water quality standards.

Table ES-2. Summary of mercury TMDLs, WLAs, and LAs for Pearl River Basin

Subsegment	Existing load	Percent reduction	Total allowable loading	∑ WLAs	∑ LAs
	lb/yr		lb/day		
090101	6.05	16	1.4E-02	6.2E-04	1.3E-02
090102	3.14	0	8.6E-03	0.0E+00	8.6E-03
090103	0.85	47	1.2E-03	0.0E+00	1.2E-03
090105	0.83	20	1.4E-03	0.0E+00	1.4E-03
090106	0.19	0	5.2E-04	0.0E+00	5.2E-04
090107	1.43	20	3.1E-03	0.0E+00	3.1E-03
090201	1.95	49	2.7E-03	0.0E+00	2.7E-03
090202-05126	0.03	59	3.5E-05	0.0E+00	3.5E-05
090203	0.99	32	1.8E-03	0.0E+00	1.8E-03
090204	1.66	41	2.7E-03	0.0E+00	2.7E-03
090205	0.16	18	3.5E-04	0.0E+00	3.5E-04
090206	0.39	18	8.9E-04	0.0E+00	8.9E-04
090207	3.46	64	3.4E-03	0.0E+00	3.4E-03
090207-05112	0.23	64	2.2E-04	7.4E-05	1.5E-04
090501	9.88	33	1.8E-02	0.0E+00	1.8E-02

Information on point source discharges to the listed subsegments was obtained from the Electronic Document Management System (EDMS) database at LDEQ. Data were pulled from these databases, and each facility was evaluated to determine whether including the facility in developing the TMDLs was appropriate. The evaluation yielded three point source discharges that might discharge mercury. Little is known, however, about the potential to discharge mercury for most of the dischargers. EPA believes it is appropriate to assume that discharges from the municipal wastewater treatment plants (WWTPs; Standard Industrial Classification code 4952) discharging greater than 100,000 gpd in these watersheds contain mercury concentrations of 12.0 ng/L. Although none of the facilities' discharge permits specify a mercury limit, LA0038831 is required to monitor and report mercury concentrations.

EPA recognizes that additional data and information might be necessary to validate the assumptions of the TMDLs and to provide greater certainty that the TMDLs will achieve the applicable water quality standard. At some point in the future, it might be appropriate to revise these TMDLs on the basis of new information gathered and analyses performed. An adaptive management approach allows EPA or the state to use the best information available at the time to establish a TMDL at levels necessary to implement applicable water quality standards and to make allocations to the pollution sources. The adaptive management approach is appropriate for these TMDLs because information on the actual contributions of mercury from both point and nonpoint sources will be much better characterized in the future. EPA expects point source loadings of mercury to be reduced primarily through mercury minimization programs developed and implemented by some point sources.

During implementation of these TMDLs, EPA expects the following activities to occur:

- National Pollutant Discharge Elimination System (NPDES) dischargers will develop and implement mercury minimization plans, as appropriate.
- Air emissions of mercury will be reduced through implementation of the Clean Air Act regulations.
- LDEQ will collect additional ambient data on mercury concentrations in water, sediment, fish, and soil.
- LDEQ will develop and implement a mercury risk reduction plan that assesses all sources of mercury.

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APPENDICES

TABLES

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1 INTRODUCTION

Section 303(d) of the Clean Water Act and the U.S. Environmental Protection Agency's (EPA) Water Quality Planning and Management Regulations (Title 40 of the *Code of Federal Regulations* [CFR] Part 130) require states to develop Total Maximum Daily Loads (TMDLs) for waterbodies that are not supporting their designated uses, even if pollutant sources have implemented technology-based controls. A TMDL establishes the maximum allowable load (mass per unit time) of a pollutant that a waterbody is able to assimilate while still supporting its designated uses. The maximum allowable load is determined on the basis of the relationship between pollutant sources and in-stream water quality. A TMDL provides the scientific basis for a state to establish water quality-based controls to reduce pollution from both point and nonpoint sources to restore and maintain the quality of the state's water resources (USEPA 1991).

Monitoring data collected by the Louisiana Department of Environmental Quality (LDEQ) indicate that observed water quality and fish consumption data sometimes exceed criteria for 15 subsegments in the Pearl River Basin. The impaired designated uses for the subsegments are primary and secondary contact recreation, fish and wildlife propagation, and outstanding natural resource water. The subsegments are characterized as fully supporting their designated uses (F), not supporting (N), insufficient data (I), or not assessed (X). Table 1-1 presents information from Louisiana's 2004 section 303(d) list for the 15 subsegments.

Table 1-1 also presents the suspected sources of mercury impairment. All subsegments are listed for atmospheric deposition. The subsegments also have the suspected cause "unknown sources," which indicates that other sources might be present but not enough data are available to identify them. Natural sources of mercury include natural degassing of the earth's crust and trace amounts of mercury present in minerals or rocks, such as cinnabar, limestone, serpentine, and sandstone (LDEQ 2004). Manmade mercury sources include pesticides, fungicides, manometers (25,000–30,000 of which are in use in Louisiana at gas line metering stations), wastewater treatment sludge, batteries, waste incinerators, paints, fluorescent light bulbs, toys, shoes, dental amalgams, and medical devices (LDEQ 2004).

Table 1-1. Subsegments and impairments addressed in this report

Sub-segment	Subsegment name	Subsegment description	Designated use				303 (d) listed suspected impairment sources	
			PCR	SCR	FWP	ONR	Source unknown	Atmospheric deposition
090101	Pearl River	Mississippi state line to Pearl River Navigation Canal	N	F	N		X	X
090102	East Pearl River	Holmes Bayou to I-10	F	F	N		X	X
090103	East Pearl River	From I-10 to Lake Borgne	F	F	N		X	X
090105	Pearl River Navigation Canal	Pools Bluff to Lock No. 3	F	F	N		X	X
090106	Holmes Bayou	Pearl River to West Pearl River	F	F	N	N	X	X
090107	Pearl River	Pearl River Navigation Canal to Holmes Bayou	F	F	N		X	X
090201	West Pearl River	Headwaters to Holmes Bayou	F	F	N	N	X	X
090202-5126	Morgan River	Porters River to West Pearl River	X	X	N	X	X	X
090203	Bogue Chitto	Pearl River Navigation Canal to Wilson Slough	F	F	N		X	X
090204	Pearl River Navigation Canal	Below Lock No.3	F	F	N		X	X
090205	Wilson Slough	Bogue Chitto to West Pearl River	I	I	N	I	X	X
090206	Bradley Slough	Bogue Chitto to West Pearl River	I	I	N	I	X	X
090207	Middle River and West Middle River	West Pearl River to Little Lake	F	F	N		X	X
090207-5112	Morgan Bayou	Headwaters near I-10 to Middle River	N				X	X
090501	Bogue Chitto	Mississippi state line to Pearl River Navigation Canal	F	F	N	N	X	X

Note: F = fully supporting, N = not supporting, I = insufficient data, X = not assessed.

2 BACKGROUND INFORMATION

2.1 General Description

The Pearl River flows along the border of Louisiana and Mississippi. It originates in Mississippi at the confluence of Nanawaya and Tallahaga creeks and flows southerly for almost 500 miles. It has a drainage area of almost 9,000 square miles. About 50 miles above its mouth, the Pearl River splits, forming the East Pearl River and West Pearl River. Both portions flow to Lake Borgne and eventually to the Gulf of Mexico. In Louisiana the Pearl River Basin includes portions of Washington and St. Tammany parishes, as well as a small portion of Tangipahoa Parish. The watershed's U.S. Geological Survey (USGS) hydrologic unit codes are 03180004 and 03180005.

The area of interest for this TMDL consists of selected subsegments in the Pearl River and East Pearl River watersheds in Washington and St. Tammany parishes. Table 2-1 lists the parish and approximate drainage area of each subsegment, and Figure 2-1 shows the locations of the subsegments.

Table 2-1. Parish and drainage area for each listed subsegment in the Pearl River Basin

Subsegment	Subsegment name	Parish	Drainage area (acres)	Tidally influenced?[a]
090101	Pearl River	Washington	57,859	No
090102	East Pearl River	St. Tammany	18,507	No
090103	East Pearl River	St. Tammany	4,505	Yes
090105	Pearl River Navigation Canal	Washington	8,121	No
090106	Holmes Bayou	St. Tammany	994	No
090107	Pearl River	St. Tammany	94	No
090201	West Pearl River	St. Tammany	10,604	Yes
090202-05126	Morgan River	St. Tammany	179	No
090203	Bogue Chitto	St. Tammany	5,182	No
090204	Pearl River Navigation Canal	St. Tammany	26,440	No
090205	Wilson Slough	St. Tammany	845	No
090206	Bradley Slough	St. Tammany	2,065	No
090207	Middle River and West Middle River	St. Tammany	18,221	Yes
090207-5112	Pearl River	St. Tammany	1,063	Yes
090501	Bogue Chitto	Washington	144,286	No

[a] David Ogé, Louisiana Department of Environmental Quality (Southeast Regional Office), personal communication, February 27, 2007.

2.2 Land Use

Land use data were obtained from the 2001 USGS National Land Cover Dataset (NLCD; Figure 2-2 and Table 2-2). The largest percentage of area is wetland, followed by forest, grass/shrub and agriculture. There is not much developed land; in fact, many segments have no developed land.

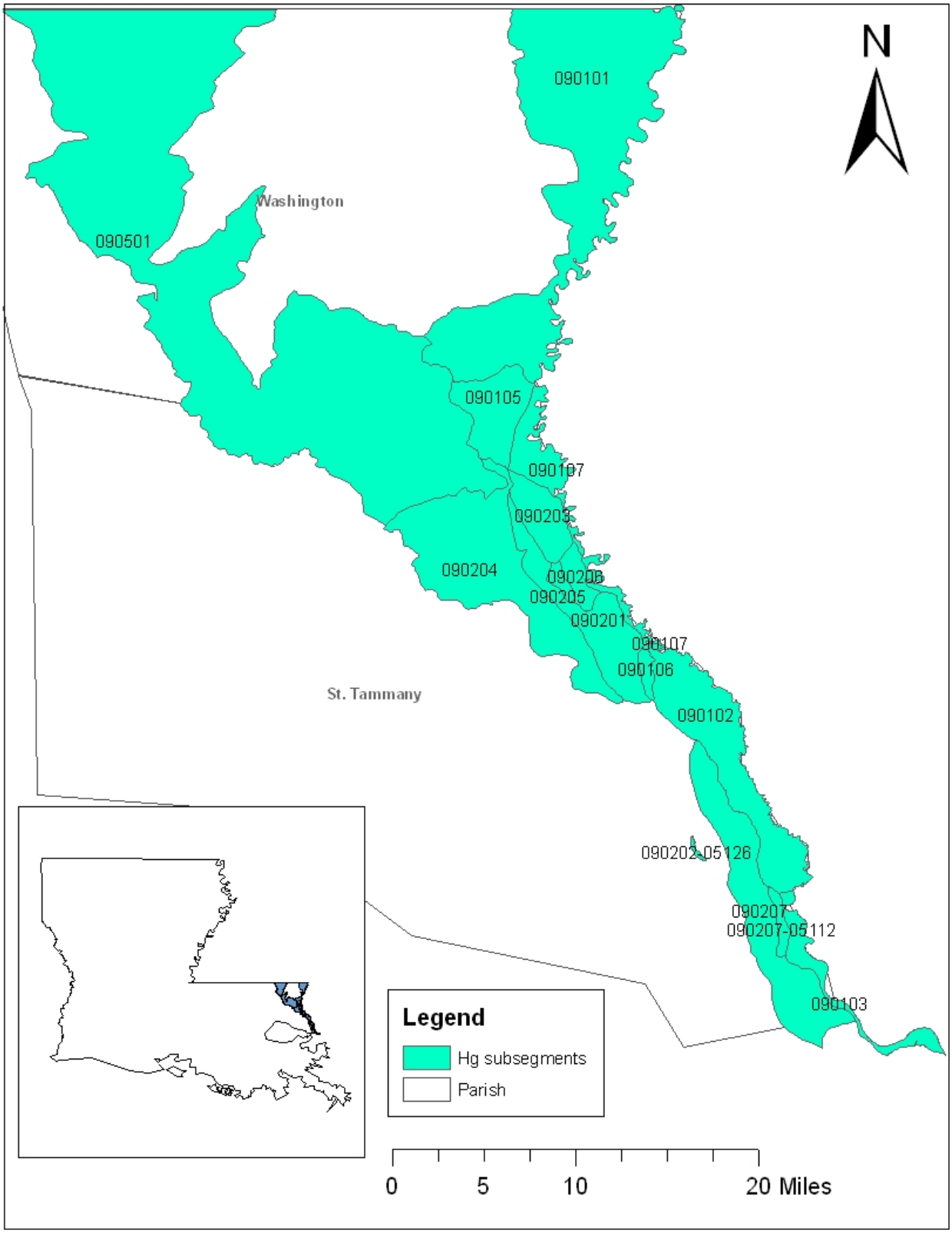

Figure 2-1. Locations of Pearl River Basin subsegments.

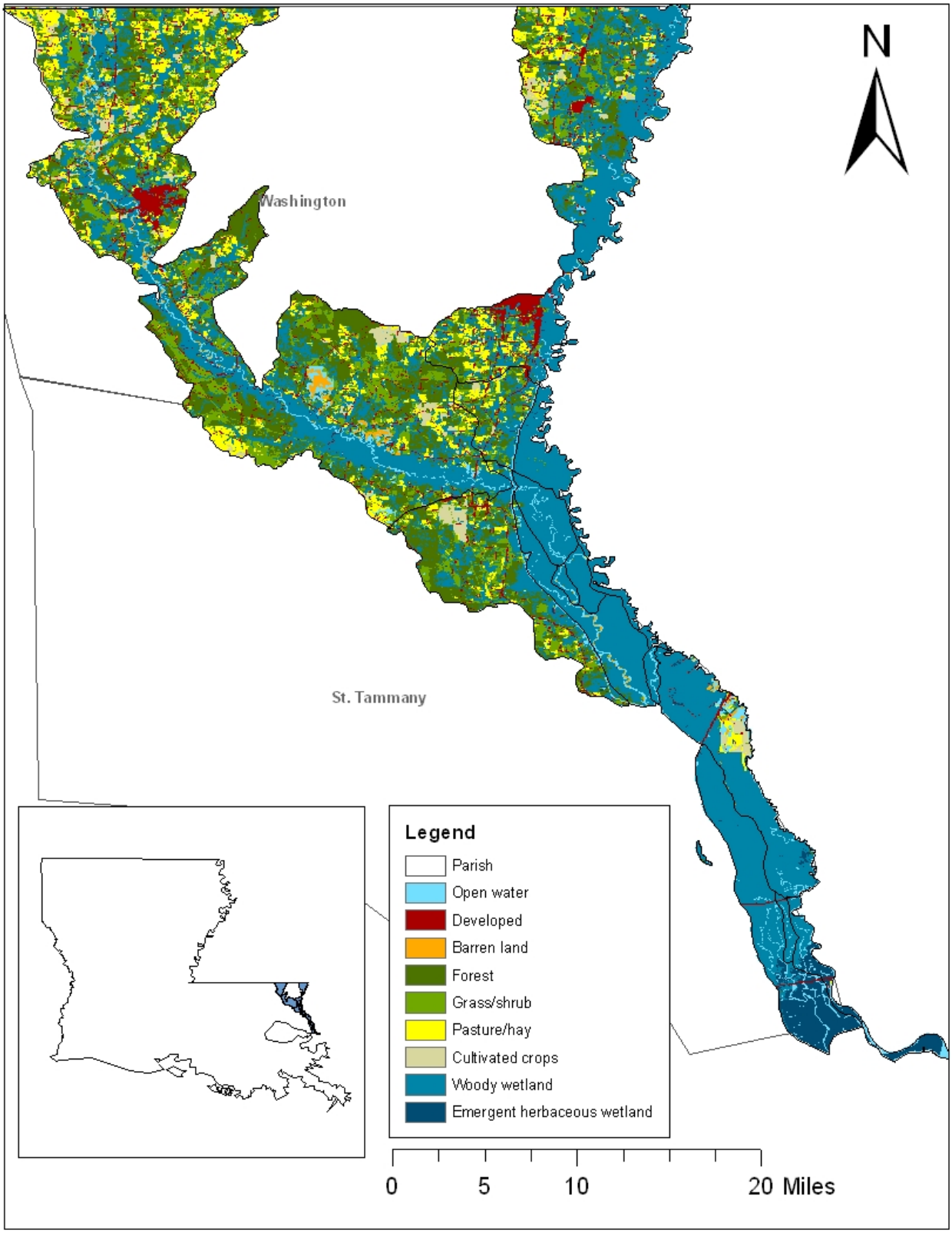

Figure 2-2. Land use in the Pearl River Basin subsegments.

Table 2-2. Land use percentages for each listed subsegment in the Pearl River Basin

Sub-segment	Open water	Developed	Barren land	Forest	Grass/ shrub	Pasture/ hay	Cultivated crops	Woody wetland	Emergent herbaceous wetland
090101	2.27	8.57	0.44	13.46	12.33	10.23	2.60	49.40	0.69
090102	6.51	1.86	1.38	0.11	0.97	3.40	3.91	79.90	1.96
090103	25.02	1.42	0.14	0.00	0.03	0.10	0.00	28.81	44.47
090105	2.60	6.83	0.09	22.56	15.31	12.76	2.42	36.04	1.40
090106	14.95	0.00	0.00	0.00	0.00	0.00	0.00	85.05	0.00
090107	6.40	0.00	0.01	0.20	0.24	0.08	0.00	92.58	0.48
090201	6.30	0.00	1.54	2.30	0.34	0.13	0.00	89.31	0.08
090202-05126	5.71	0.00	0.00	10.81	0.00	0.00	0.00	80.62	2.86
090203	7.15	0.00	0.00	0.55	0.07	0.03	0.00	92.11	0.10
090204	2.27	5.14	0.07	33.17	19.79	5.37	3.81	29.88	0.51
090205	12.38	0.00	2.71	0.00	0.16	0.00	0.00	84.75	0.00
090206	2.31	0.00	0.36	0.00	0.06	0.16	0.00	97.11	0.00
090207	6.30	1.07	0.02	0.02	0.00	0.00	0.00	63.07	29.52
090207-05112	5.45	1.90	0.00	0.00	0.00	0.00	0.00	92.65	0.00
090501	2.62	6.12	1.63	23.31	18.12	12.15	3.06	32.29	0.71

2.3 Hydrology

The USGS online hydrology database (NWISWeb) contains four stations with flow data for the subsegments that are impaired for mercury. These stations are listed in Table 2-3, with the period of record and measure of completeness for each gauge, and are shown in Figure 2-3. Most of subsegments in the basin that require TMDLs do not have USGS gauges associated with them. The lower portions of the basin are tidally influenced; however, the Pearl River Navigation Canal is not tidally influenced because locks are present. USGS flow data were not used in developing the TMDLs.

Table 2-3. Current USGS flow stations in the Pearl River Basin

Station	Station name	Sub-segment	Start date	End date	Percent complete	Depth data	7Q10 (cfs)[a]
02489500	Pearl River near Bogalusa, LA	090101	1/1/1980	7/12/2006	100	Yes	1,400
02491500	Bogue Chitto River at Franklinton, LA	090501	10/1/1997	7/12/2006	No data	Yes	425
02492000	Bogue Chitto River near Bush, LA	090501	1/1/1980	7/12/2006	100	Yes	485
301141089320300	East Pearl River at CSX RR near Claiborne, MS	090103	8/22/2001	11/13/2002	98	Yes	n/a

[a] Source: "Low Flow Characteristics of Louisiana Streams," prepared by USGS in cooperation with the Louisiana Department of Transportation and Development, 2003.

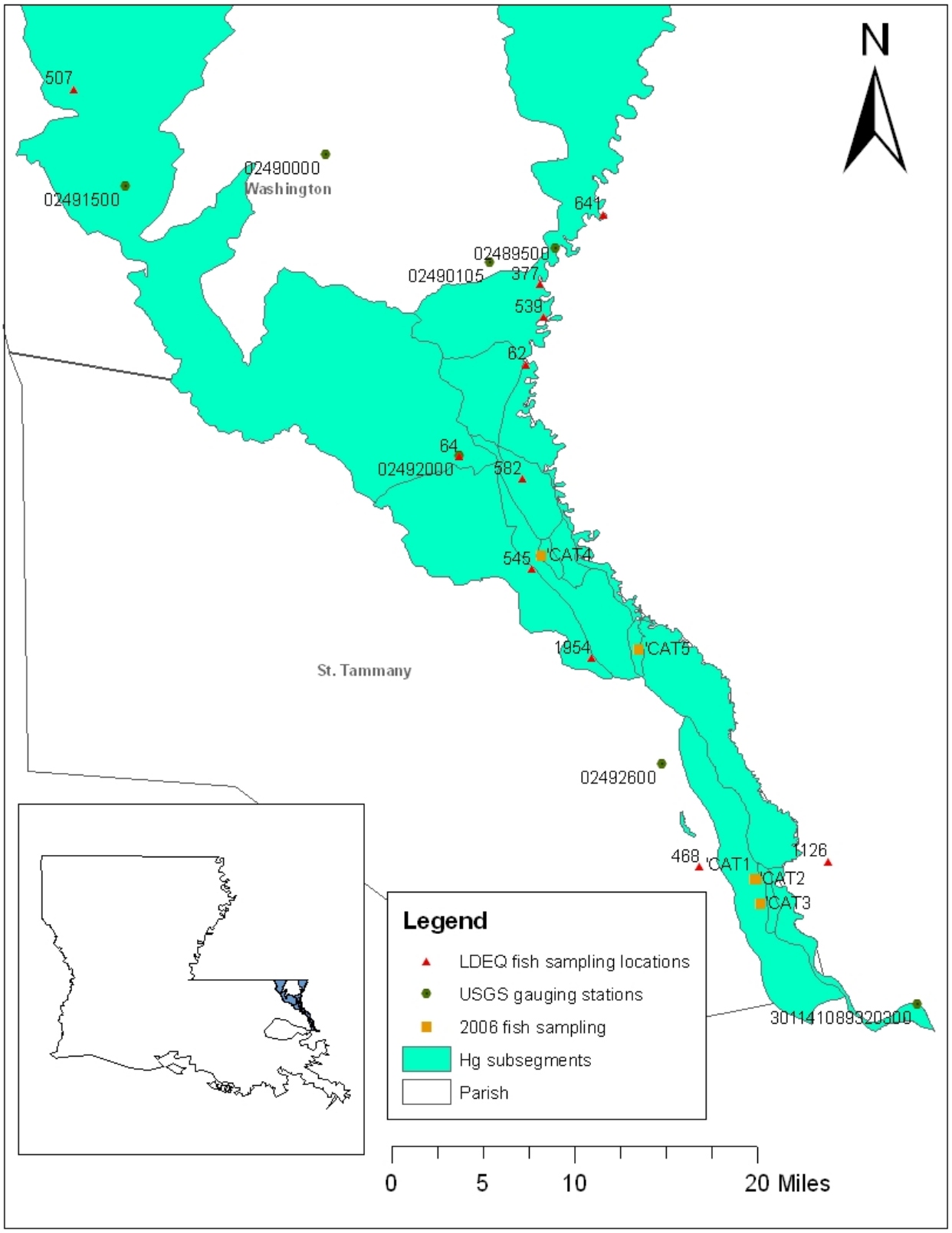

Figure 2-3. Locations of fish tissue sampling stations and USGS flow gauges in the Pearl River Basin.

2.4 Designated Uses and Water Quality Criteria

Louisiana's 2004 section 303(d) list indicates that the 15 listed subsegments—all assigned a use of primary or secondary contact recreation, fish and wildlife propagation, or outstanding natural resource water—are not meeting applicable water quality standards because of impairments suspected to be the result of nonpoint atmospheric deposition. Primary contact recreation includes any recreational or other water contact involving full-body exposure to water and a considerable probability of ingesting water. Examples are swimming and water skiing. Secondary contact recreation involves activities like fishing, wading, or boating, where water contact is accidental or incidental and there is a minimal chance of ingesting appreciable amounts of water.

Fish and wildlife propagation includes the use of water for aquatic habitat, food, resting, reproduction, cover, or travel corridors for any indigenous wildlife and aquatic life species associated with the aquatic environment. Outstanding natural resource waters are waterbodies designated for preservation, protection, reclamation, or enhancement of wilderness, aesthetic qualities, and ecological regimes, such as those designated under the Louisiana Natural and Scenic Rivers System or those designated by LDEQ as waters of ecological significance.

The state's numeric criteria were used in conjunction with the assessment methodology presented in LDEQ's section 305(b) report (LDEQ 2002). The assessment methodology specifies that primary contact recreation, secondary contact recreation, fish and wildlife propagation, and outstanding natural resource uses are to be fully supported. Mercury levels in fish tissue are not to exceed the state's criterion, 0.5 ppm.

The Louisiana water quality standards also include an antidegradation policy (*Louisiana Administrative Code* [LAC] Title 33, Part IX, Section 1109.A), which states that state waters exhibiting high water quality should be maintained at that high level of water quality. If that is not possible, water quality of a level that supports the designated uses of the waterbody should be maintained. The designated uses of a waterbody may be changed to allow a lower level of water quality only through a use attainability study.

2.5 Point Sources

LDEQ stores permit information using internal databases. Information on point source discharges to the listed subsegments was obtained from the Electronic Document Management System (EDMS) database at LDEQ. Data were pulled from these databases and analyzed for the TMDLs. Each facility was evaluated on the basis of its discharges and the relevant subsegment's 303(d) listing to determine whether the facility would be used in developing the TMDLs. The evaluation yielded three point source discharges (Table 2-4) that could have a mercury concentration. This report considers only permitted municipal facilities with flows greater than 100,000 gpd. None of the facilities' discharge permits specify a mercury limit; however, LA0038831 is required to monitor and report mercury concentrations. The water quality criterion maximum of 12 ng/L was assumed for the selected permits.

The land use statistics show that most of these watersheds consist largely of wetlands, water, and forests, which are largely undeveloped, natural areas. The Pearl River Basin consists of vast areas of swamps and marshes, especially in the lower reaches, which contribute a large natural

Table 2-4. Point source discharge information for the Pearl River Basin

Permit number	Facility name	Subsegment	Outfall	Flow (gpd)	Receiving water	Estimated Hg load (gr/d)[a]
LA0046515	City of Bogalusa -WWTP	090101	001	6,000,000	Pearl River	0.273
LA0060275	Washington Correctional Institute	090101	001	250,000	Mayfield Creek	0.011
LA0038831[b]	Town of Franklinton-Wastewater Treatment	090501	001	740,000	ditch-Bogue Chitto	0.034

[a] An assumed water quality criterion maximum of 12 ng/L was used.
[b] This facility is required to monitor and report mercury concentrations, but it does not have any limit for mercury.

organic load to the waterbodies. The organic load, in turn, creates conditions that are conducive to the production of methyl mercury. What contribution natural sources make to the mercury impairment in this watershed is not clear. These natural conditions might not be affected by implementing the TMDLs, and more data are needed to assess these natural contributions.

2.6 Nonpoint Sources

Outflow from five upstream subsegments in the Pearl River Basin was used along with the water quality criterion to determine the loading from these subsegments. The water quality criterion was used because of the lack of available upstream water column data. Table 2-5 shows the estimated upstream loads. Because there are no flow stations for these subsegments, these calculations used a regression based on USGS station average flows and their drainage areas. The USGS drainage areas from stations near the TMDL area were plotted against their respective average flow. The resulting equation, which is shown in Figure 2-4, has an R^2 value of 0.987.

Table 2-5. Upstream load data

Study area	Upstream segments	Upstream Area (mi^2)	Average Mercury (g/L)	Flow[a] (cfs)	Upstream load (g/yr)
Pearl River (090101)	090301	73	1.2E-09	131.25	140.66
	090401	76	1.2E-09	136.84	146.66
	090104	41	1.2E-09	76.29	81.76
Bogue Chitto (090501)	090504	51	1.2E-09	93.94	100.67
	090506	17	1.2E-09	32.35	34.67

[a] From USGS flow unit average flow.

Louisiana's section 303(d) list identifies atmospheric deposition as the suspected cause of the mercury impairment in the subsegments of the Pearl River Basin. The predominant land use in the impaired subsegment watersheds is wetland. The percentage of wetlands in the watersheds ranges from 30 percent to 97 percent. The watersheds also contain pasture, cropland, forest, and urban areas. The regional atmospheric deposition data (Table 2-6) were obtained from the National Atmospheric Deposition Network. Station LA28 is in Tangipahoa Parish (Figure 2-5).

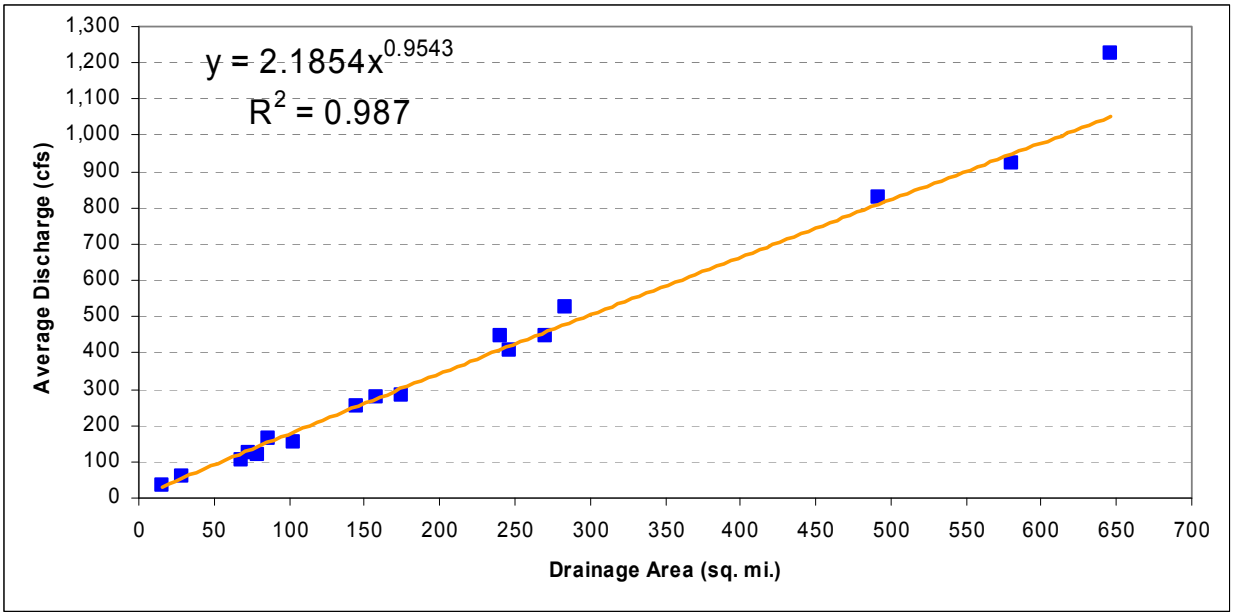

Figure 2-4. USGS unit average flow regression.

Table 2-6. Atmospheric deposition data

Sub-segment	Station	Period of record	No. of records	No. of obs.	Min. Hg conc. (ng/L)	Min. Hg load (ng/m^2)	Max. Hg conc. (ng/L)	Max. Hg load (ng/m^2)	Avg. Hg conc. (ng/L)	Avg. Hg load (ng/m^2)
040701	LA28	10/7/1998–12/27/2005	381	274	0.62	4.38	99.56	2,747	14.93	339

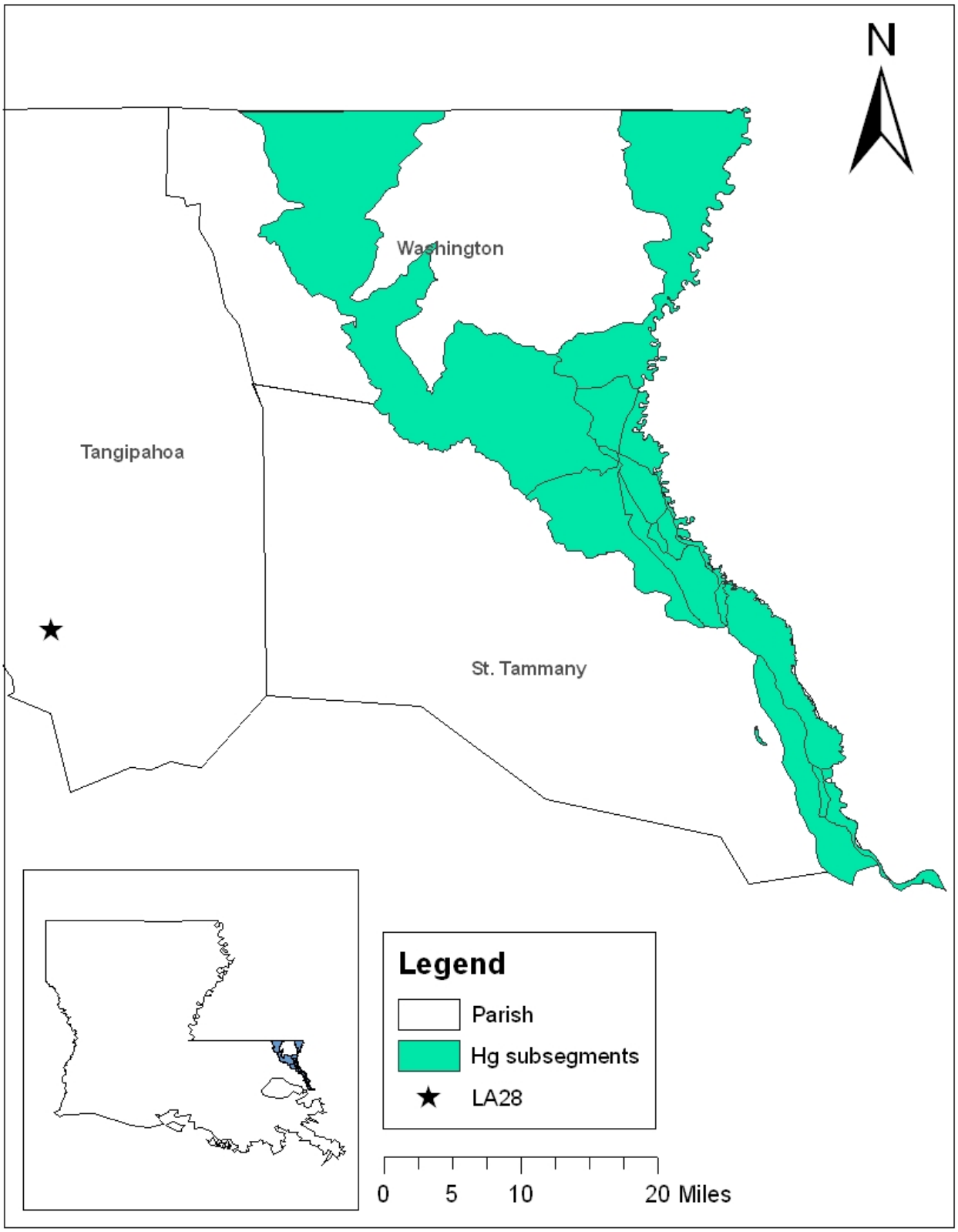

Figure 2-5. Locations of mercury atmospheric deposition station.

3 CHARACTERIZATION OF EXISTING WATER QUALITY

3.1 Comparison of Observed Data to Criterion

Water quality monitoring data for each listed subsegment were obtained from LDEQ. LDEQ mercury water quality data were available for 16 stations in 15 subsegments (Figure 3-1 and Table 3-1). Four of the stations had more than 100 data points, another had more than 50, and the remainder had fewer than 7. Many of the samples collected exceeded the water quality criterion, 12 ng/L (0.012 μg/L).

Two types of mercury are present in the environment—inorganic and organic. The organic or methyl mercury form is the primary species of concern. Methyl mercury bioaccumulates in the proteins of fish and other organisms, resulting in increases through the various trophic levels. For example, younger fish typically have lower concentrations than older fish.

3.2 Analysis of Fish Sampling

Louisiana has a mercury fish tissue criterion of 0.5 ppm (mg/kg). EPA's criterion is 0.3 ppm. Louisiana's mercury fish tissue criterion was used in this TMDL. LDEQ sampled in the Pearl River Basin from 1995 to 2004, using nine monitoring locations in seven subsegments. During that period 45 maximum concentrations exceeded the LDEQ criterion of 0.5 ppm and 29 locations had an average concentration above the criterion. Another sampling survey occurred at five additional stations in August 2006.

After Hurricane Katrina made landfall on Monday, August 29, 2005, as a Category 4 hurricane, local residents and Louisiana Department of Wildlife and Fisheries (LDWF) personnel noted that several fish kills had occurred within the basin. LDWF restocked the Pearl River Basin with catfish. It is possible, therefore, that during the 2006 sample survey some of the fish caught were from the restocking. That is, the sampling events that occurred August 17, 2006, and August 18, 2006, could represent a hurricane-impacted condition. The 2006 sampling event showed that two subsegments in this TMDL had catfish as the worst-case fish species. These subsegments are subsegments 090205 and 090206. On the basis of this recent monitoring, subsegment 090106, requires no reduction in mercury. The catfish analyzed for these subsegments might have been those restocked by LDWF after Hurricane Katrina. Fish sample data from LDEQ and the 2006 survey are provided in Appendix A.

3.3 Sediment Data

Additional information on mercury was obtained from the LDEQ Mercury Study. Sediment concentrations were obtained for eight monitoring locations in six subsegments for inorganic mercury (Table 3-2) and for two monitoring locations in two subsegments for organic mercury (Table 3-3). Most of the subsegments had only one or two data points for sediment. Two subsegments had five or six sampling events for inorganic mercury in sediment. Figure 3-1 shows the sediment sampling locations.

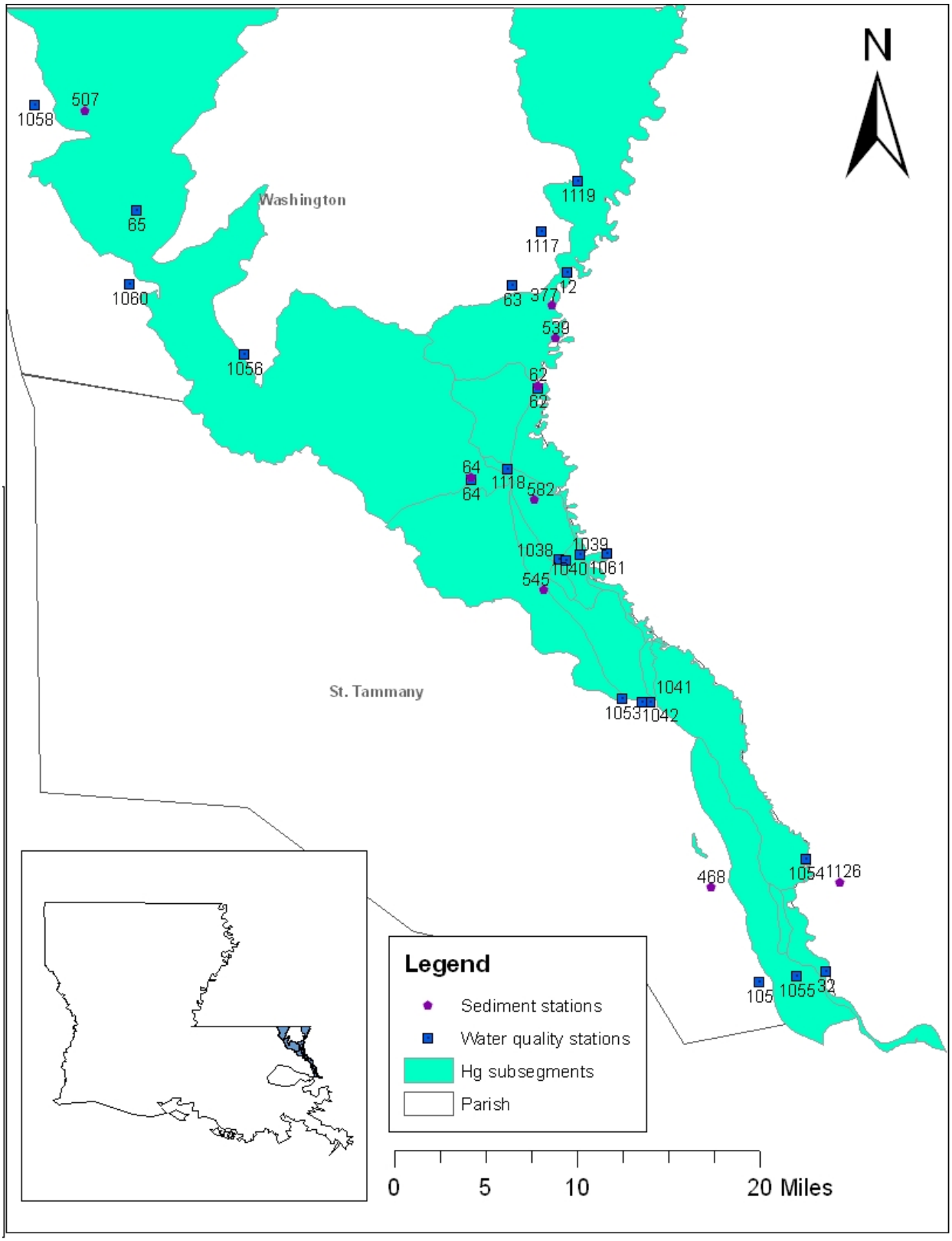

Figure 3-1. Locations of environmental sampling stations in Pearl River Basin.

Table 3-1. Summary of water column data in the Pearl River Basin

Subsegment	Station	Station name	Period of record	No. of obs.	Total Hg minimum (µg/L)	Total Hg maximum (µg/L)	Total Hg average (µg/L)
090101	0012	Pearl River east of Bogalusa, Louisiana	5/8/1978–5/11/1998	152	0.05	1.90	0.18
090101	0062	Pearl River at Pools Bluff, Louisiana	4/13/1981–3/29/2006	63	ND	1.70	0.24
090102	1054	East Pearl River at Curtis Johnson Waterfront Park boat launch	3/6/2001–3/28/2006	7	ND	0.05	0.01
090103	0032	Pearl River (East) at Pearlington, Mississippi	5/9/1978–3/28/2006	158	ND	1.10	0.16
090105	1118	Pearl River Navigation Canal at Lock No. 3, Louisiana	5/15/2001–3/29/2006	7	ND	ND	ND
090106	1041	Holmes Bayou at West Pearl River	3/6/2001–4/11/2006	4	ND	0.05	0.02
090107	1061	Pearl River at Walkian Bluff boat launch	3/7/2001–11/27/2001	6	ND	0.05	0.02
090201	1042	West Pearl River upstream from Pearl River Barge Canal Lock No. 1	3/6/2001–4/11/2006	5	ND	0.05	0.01
090202	0105	Pearl River (West) southeast of Slidell, Louisiana	4/14/1981–3/28/2006	177	ND	1.50	0.14
090203	1038	Bogue Chitto River upstream from Wilson Slough	3/7/2001–11/27/2001	3	0.00	0.12	0.04
090204	1053	Pearl River Navigation Canal at Lock #1	3/6/2001–4/11/2006	7	ND	0.05	0.01
090205	1040	Wilson Slough at intersection with West Pearl River	3/7/2001–11/27/2001	3	ND	0.05	0.02
090206	1039	Bradley Slough at intersection with Wilson Slough	3/7/2001–11/27/2001	3	ND	0.05	0.02
090207	1055	Middle Pearl River at Hwy 90	3/6/2001–3/28/2006	6	ND	0.05	0.01
090501	0064	Bogue Chitto River near Bush, Louisiana	4/13/1981–3/29/2006	134	ND	1.46	0.15
090501	0065	Bogue Chitto River at Franklinton, Louisiana	4/13/1981–4/13/1998	101	0.05	2.30	0.22

Table 3-2. Available inorganic mercury sediment data for the Pearl River Basin

Subsegment	Station	Station name	Period of record	No. of obs.	Hg minimum (mg/kg)	Hg maximum (mg/kg)	Hg average (mg/kg)
090101	377	Pearl River near Bogalusa, Louisiana	8/31/1994–5/19/1999	2	ND	0.210	0.105
090101	539	Pearl River near Bogalusa, Louisiana	7/25/1996	1	0.280	0.280	0.280
090107	62	Pearl River at Pools Bluff, Louisiana	5/24/2000	1	ND	ND	ND
090203	582	Bogue Chitto River southeast of Sun, Louisiana	4/17/1997	1	1.050	1.050	1.050
090204	545	Pearl River Diversion Canal near Talisheek, Louisiana	8/8/1996–7/30/2002	2	0.001	0.080	0.041
090501	64	Bogue Chitto River near Bush, Louisiana	8/31/1994–9/14/2004	6	0.001	0.040	0.018
090501	507	Bogue Chitto River near Clifton, Louisiana	10/19/1995–5/9/1996	2	0.001	0.001	0.001
090103	1126	Pearl River southwest of Napoleon, Louisiana	2/5/2001	1	0.020	0.020	0.020

Table 3-3. Available organic mercury sediment data for the Pearl River Basin

Subsegment	Station	Station name	Period of record	No. of obs.	Methyl Hg minimum (µg/kg)	Methyl Hg maximum (µg/kg)	Methyl Hg average (µg/kg)
090204	545	Pearl River Diversion Canal near Talisheek, Louisiana	7/30/2002	1	0.57	0.57	0.57
090501	64	Bogue Chitto River near Bush, Louisiana	7/30/2002–9/14/2004	2	0.03	0.05	0.04

4 TMDL DEVELOPMENT

A TMDL is the total amount of a pollutant that can be assimilated by the receiving waterbody while still achieving water quality standards. In TMDL development, allowable loadings from all pollutant sources that cumulatively amount to no more than the TMDL must be established, thereby providing the basis for establishing water quality-based controls.

A TMDL for a given pollutant and waterbody is composed of the sum of individual wasteload allocations (WLAs) for point sources and load allocations (LAs) for nonpoint sources and natural background levels. In addition, the TMDL must include an implicit or explicit margin of safety (MOS) to account for the uncertainty in the relationship between pollutant loads and the quality of the receiving waterbody. The TMDL components are illustrated using the following equation:

$$TMDL = \sum WLAs + \sum LAs + MOS$$

4.1 TMDL Analytical Approach

To estimate the mercury loading to the watershed, a two-step method was used. Point and nonpoint source loadings were estimated, and necessary reductions in fish tissue mercury concentrations were calculated.

Nonpoint Source Loading Estimates

Nonpoint source loads were estimated from regional atmospheric deposition. Data were obtained from the National Atmospheric Deposition Program (NADP). Station LA28 is in Tangipahoa Parish, which is just west of the basin. Data obtained from that station were for wet deposition from 1999 through 2005. Dry deposition was calculated as 50 percent of the wet deposition; 40 to 60 percent of wet is an acceptable estimate for dry deposition (USEPA 2001b). Dry and wet deposition were combined to obtain total deposition.

Precipitation data were also available for the monitoring site. Those data were compared with precipitation data from National Climatic Data Center (NCDC) stations in and around the Pearl River Basin. By dividing the average annual precipitation for the basin by the precipitation at LA28, an atmospheric deposition correction factor was obtained. Multiplying the deposition at LA 28 by the deposition correction factor produced precipitation-corrected regional atmospheric deposition values for the Pearl River Basin.

Only direct mercury loading was calculated in this TMDL. For each subsegment the sum of the open water and wetland land use areas was used. Indirect loading by erosion and overland flow was considered minimal because there is very little agriculture and developed land in the basin.

Point Source Load Estimates

Information on point source discharges to the listed subsegments was obtained from the EDMS database at LDEQ. No permits specified a mercury limit. The water quality criterion maximum of 12 ng/L was assumed for the facility discharges in Table 2-4, and it was multiplied by the available flow to obtain a load.

Load Reduction Estimates

EPA has a fish tissue mercury concentration maximum of 0.5 ppm. To establish a reduction in selected segments, the average of the worst-case species was used. The species average was divided by the target fish tissue concentration. Appendix B contains the TMDL calculations.

Equations Used for TMDL Calculation (USEPA 2001a):

Equation 4-1: $RF = MC/SC$

RF = reduction factor
MC = measured tissue concentration of worst-case species
SC = safe tissue mercury concentration (0.5 ppm)

Equation 4-2: $TMDL = (EL/RF) \times SF$

EL = existing load (nonpoint and point sources)
RF = reduction factor
SF = site-specific factor (assumed to be 1[1])

This TMDL calculation method relied on several assumptions. A linear relationship was assumed between fish tissue concentrations and methyl mercury reductions, which is consistent with bioaccumulation factors and steady state assumptions. Point sources were assumed to discharge at a constant rate and at a constant mercury concentration equal to the water quality criterion. Factors affecting the site-specific factor were assumed negligible until more information is available. Atmospheric deposition was assumed to be significant only when applied directly to water or wetlands.

4.2 TMDLs, WLAs, and LAs

Table 4-1 presents the TMDLs and allocations for the subsegments in this report.

Wasteload Allocation

The WLA portion of the TMDL is the total loading of a pollutant that is assigned to point sources. Of the point sources evaluated in this TMDL three were considered to possess the reasonable potential to contain mercury in their discharge (Table 4-2). The point sources identified include municipal wastewater treatment facilities. There were no MS4 municipalities discharging into the impaired subsegments.

[1] Mercury loading capacity differs by waterbody depending on the physical and chemical variables. The site-specific factor might be based on measured sulfate, organic carbon, alkalinity, or pH values, as well as the influence of mercury methylation and bioaccumulation. Because of the complex nature of mercury bioaccumulation and other factors, the site-specific factor was assumed to be 1. In the future, better technologies and model refinements will allow other factors to be considered.

Table 4-1. Summary of TMDLs, WLAs, and LAs for Pearl River Basin

Subsegment	Existing load	Percent reduction	Total allowable loading	∑ WLAs	∑ LAs
	lb/yr		lb/day		
090101	6.05	16	1.4E-02	6.2E-04	1.3E-02
090102	3.14	0	8.6E-03	0.0E+00	8.6E-03
090103	0.85	47	1.2E-03	0.0E+00	1.2E-03
090105	0.83	20	1.4E-03	0.0E+00	1.4E-03
090106	0.19	0	5.2E-04	0.0E+00	5.2E-04
090107	1.43	20	3.1E-03	0.0E+00	3.1E-03
090201	1.95	49	2.7E-03	0.0E+00	2.7E-03
090202-05126	0.03	59	3.5E-05	0.0E+00	3.5E-05
090203	0.99	32	1.8E-03	0.0E+00	1.8E-03
090204	1.66	41	2.7E-03	0.0E+00	2.7E-03
090205	0.16	18	3.5E-04	0.0E+00	3.5E-04
090206	0.39	18	8.9E-04	0.0E+00	8.9E-04
090207	3.46	64	3.4E-03	0.0E+00	3.4E-03
090207-05112	0.23	64	2.2E-04	7.4E-05	1.5E-04
090501	9.88	33	1.8E-02	0.0E+00	1.8E-02

Table 4-2. Summary of WLAs for Pearl River Basin

Permit #	Outfall	Facility Name	Facility Outfall	Flow (gpd)	Type	Mercury load (lb/yr)
			090101			
LA0046515	001	City of Bogalusa-WWTP	Treated Sanitary Wastewater	6,000,000	Average	2.19E-01
LA0060275	001	Washington Correctional Institute	Treated Sanitary Wastewater	250,000	Design	9.12E-03
					Total	**2.28E-01**
			090501			
LA0038831	001	Franklinton Town of - Wastewater Treatment Facility	Treated Sanitary Wastewater	740,000	Average	2.70E-02

Little is known about the potential to discharge mercury for most of the dischargers. EPA believes it is appropriate to assume that discharges from the municipal WWTPs (SIC 4952) discharging greater than 100,000 gpd in these watersheds will contain mercury concentrations less than 12.0 ng/L. The WLAs in Table 4-2 are based on the available permit flow levels.

LDEQ disagrees with the assumption that was used that all point sources discharge at a constant rate and at a constant mercury concentration equal to the water quality criterion for mercury. Current LDEQ policy is to assess discharges for the reasonable potential to discharge mercury.

Where reasonable potential exists or where effluent analyses demonstrate mercury at levels above 12 ng/l in the effluent, the LPDES permit will require the development of a mercury minimization program and/or a mercury limitation will be placed in the permit to assure compliance with the TMDL.

Load Allocation

The LA is the portion of the TMDL assigned to nonpoint sources such as atmospheric deposition and natural background loadings. For this TMDL, the LA was calculated by subtracting the WLA from the total TMDL allocation. LAs were not allocated to separate nonpoint sources because of the lack of available source characterization data. The LAs are presented in Table 4-1.

4.3 Margin of Safety

The MOS is the portion of the pollutant loading reserved to account for any uncertainty in the data. There are two ways to incorporate the MOS (USEPA 1991). One way is to incorporate it implicitly by using conservative model assumptions to develop allocations. The other way is to explicitly specify a portion of the TMDL as the MOS and use the remainder for allocations.

For this analysis, the MOS is implicit. Conservative assumptions in the TMDL process are the following:

- Calculations for mercury concentrations associated with total suspended solids loading from soil erosion to the water column assumed no loss of mercury from any mechanism during transport.
- Mercury loading to the 303(d)-listed subsegment was considered 100 percent available for uptake, bioaccumulation, and biomagnification by fish.
- There was an implicit MOS because a tissue methyl mercury endpoint is used when fish tissue analysis is based on total mercury measurements.
- For facilities with mercury permit limits, the permit limits were used to establish the mercury loads from the facilities. The actual discharge of mercury from the facilities is probably less.
- For municipal WWTPs (SIC 4952) with flows greater than 100,000 gpd, it was assumed that 12.0 ng/L of mercury was discharged from each facility. The actual discharge of mercury from these facilities might be less than this value.
- The REMSAD model overestimates the actual input based on a comparison to available Mercury Deposition Network (MDN) data.

5 FUTURE ACTIVITIES

5.1 Pollution Prevention

The key element of pollution prevention is *source reduction* through product substitution and innovation. From 1988 to 1997 the U.S. industrial demand for mercury dropped 75 percent (USEPA 2007a). Reductions in mercury use have been driven by voluntary efforts and by increasingly strict federal and state regulations, such as the increasing regulation of mercury in products or outright bans on the use of mercury in products for which alternatives are available. For example, in 1996 EPA eliminated the use of mercury in most batteries under the Mercury Containing and Rechargeable Battery Management Act. Other voluntary measures such as a commitment by the American Hospital Association to reduce the use of mercury-containing products will continue to decrease the amount of mercury available in the waste stream. Next to source reduction, *recycling* is fundamental to mercury pollution prevention. When mercury must be used and recycling is not possible, *proper disposal* is critical to reducing the potential of dispersion to the environment.

5.2 National Assurances

EPA estimates that 60 percent of the total mercury deposited in U.S. waterbodies, which contaminates fish, comes from domestic anthropogenic air emission sources (USEPA 1997). The largest emitters of mercury to the atmosphere are coal-fired electric power plants. Under the Clean Air Act Amendments of 1990, EPA has issued stringent regulations to dramatically reduce and cap air pollutant emissions. Mercury emissions nationwide were reduced by 45 percent by the year 1999 compared to 1990 mercury emissions (USEPA 2007b). The benefit of the existing regulations has resulted in a decrease of both mercury deposition and mercury concentration in fish tissue in the Florida Everglades in the last 10 years. Mercury emissions in south Florida have declined from a high of 3,000 kg/yr in 1991 to 250 kg/yr in 2000, with a corresponding reduction in mercury deposition from a high in 1998 of 26 $\mu g/m^2$-yr to 17 $\mu g/m^2$-yr and a corresponding decline in tissue concentrations of mercury in largemouth bass from 1.7 mg/kg in 1991 to 0.4 mg/kg in 2000 (USEPA 2003).

Section 112 of the Clean Air Act and 40 CFR Parts 61 and 63 (maximum achievable control technology [MACT] rules) will also continue to ensure reductions in air emissions over the next decade. MACT standards require sources to meet specific emissions limits based on emissions levels already being achieved by many similar sources in the country. EPA also applies a risk-based approach to assess how these technology-based emissions limits are reducing risks to human health and the environment (USEPA 2007c).

Other emissions limitations issued by EPA include the following:

- **Municipal Waste Combustors (MWC):** In 1995 EPA issued emission limits for MWCs based on MACT. The implementation date for new and existing MWCs was December 2000. Overall mercury emissions from MWCs were estimated to be 54 tons per year in 1990, and this regulation is expected to reduce mercury emissions from these types of facilities by at least 90 percent.
- **Medical and Waste Incinerator (MWI):** In August 1997 EPA issued emission limits for MWIs. The implementation date for new and existing MWIs was September 2002.

Overall mercury emissions from MWIs are estimated to be reduced by 94 percent or more because of this regulation.

- **Hazardous Waste Combustors (HWC):** In 1999 EPA issued emissions standards for HWCs, including cement kilns and lightweight aggregate kilns that burn hazardous waste. Overall mercury emissions from HWCs were estimated to be 2.5 percent of the total national mercury emissions in 1990. This regulation has not been implemented pending final resolution of a lawsuit. Once it is fully implemented, mercury emissions from HWCs are expected to be reduced by at least 50 percent.
- **Chlor-Alkali Plants:** Late in 2003 EPA issued a final regulation to reduce mercury emissions from chlorine production plants that rely on mercury cells. When the rule first became effective, there were 20 such plants in the United States; today there are 9. The regulation, which requires a combination of controls for point sources (such as vents) and management practices to address fugitive emissions will reduce mercury emissions from chlor-alkali plants by about 50 percent.
- **Industrial Boilers:** In September 2004 EPA issued a regulation to reduce emissions of mercury and other toxic air pollutants from industrial boilers that burn coal or other substances, such as wood, to produce steam. The steam is used to produce electricity or mechanical energy or to provide heat. These boilers are used at facilities like refineries, chemical and manufacturing plants, and paper mills or they stand alone to provide heat for shopping malls and university heating systems. It is expected that this rule will reduce mercury emissions by one-third.

On March 15, 2005, EPA issued the first-ever federal rule to permanently cap and reduce mercury emissions from coal-fired power plants. The Clean Air Mercury Rule (CAMR) makes the United States the first country in the world to regulate mercury emissions from coal-fired power plants. This rule establishes “standards of performance” limiting mercury emissions from new and existing coal-fired power plants. It also creates a market-based cap-and-trade program that will reduce nationwide utility emissions of mercury in two distinct phases. The first phase cap is 38 tons, and emissions will be reduced by taking advantage of “co-benefit” reductions—mercury reductions achieved by reducing emissions of sulfur dioxide and nitrogen oxides under the Clean Air Interstate Rule (CAIR). In the second phase, due in 2018, coal-fired power plants will be subject to a second cap, which will reduce emissions to 15 tons upon full implementation. The proposed rule includes two alternatives. The first alternative would require power plants to install MACT to achieve an estimated 30 percent reduction in mercury emissions by 2008. This would, when fully implemented, reduce emissions of mercury from coal-fired power plants by 70 percent by 2020. New coal-fired power plants (those for which construction started on or after January 30, 2004) will have to meet stringent new source performance standards in addition to being subject to the caps (USEPA 2007b).

CAMR became effective May 18, 2006. This phasing of the national CAMR is insufficient to meet the adaptive implementation of this TMDL. As noted earlier, the rule established a cap-and-trade program, which will allow power plants to purchase emissions reduction allowances from other power plants and potentially bank the allowances to meet compliance requirements in future years (NEIWPCC 2007).

In March 2007 EPA provided guidance to states, territories, and tribes on listing waters impaired by atmospheric mercury under Clean Water Act section 303(d), also known as "subcategory 5m." EPA provides information to states, territories, and tribes regarding a voluntary approach for listing waters impaired by mercury mainly from atmospheric sources. The approach uses Clean Water Act tools to encourage comprehensive state and regional mercury control programs. EPA recommends the voluntary approach for states that have in place a comprehensive mercury reduction program with elements recommended by EPA. Such states may separate their waters impaired by mercury primarily from atmospheric sources into a specific subcategory ("5m") of their Clean Water Act section 303(d) lists. States using this approach may also defer development of TMDLs for mercury-impaired waters as a result of having implemented mercury reduction programs. Rather than deferring action, the 5m approach recognizes states that are already taking action in advance of TMDLs to address their mercury sources and achieve environmental results earlier than required (USEPA 2007a).

5.3 State-Level Assurances: LDEQ Statewide Mercury Program

EPA and LDEQ have taken key steps nationally and regionally toward reducing mercury emissions and the environmental and human health risks associated with mercury exposure. State and federal mercury air emission rules apply to facilities in Louisiana (LAC 33: III. Chapter 51). EPA expects that a combination of ongoing and future activities under the Clean Air Act will achieve reductions in air deposition of mercury that will enable progress toward achieving water quality standards.

If a facility is found to discharge mercury at levels above 12 ng/L, a mercury minimization plan may be required. EPA expects that the State of Louisiana, as the duly authorized permitting authority, will determine any additional necessary elements of a mercury characterization/ minimization plan, considering the size and nature of the affected facility. Local characteristics like water velocity, bed substrate, oxygen content, and microbial community structure all contribute to methylation potential. Because these characteristics have not been defined for each of the dischargers in each subsegment, there is a possibility that effluent containing mercury might cause localized exceedances of the criteria. Therefore, minimization plans, numeric limits, or both might be necessary to ensure that the discharge does not cause or contribute to an exceedance of the applicable water quality standards. Finally, because of the uncertainty in the TMDL analysis, mercury minimization plans, numeric limits, or both might be necessary to ensure compliance with the water quality standards. Considering the large number of NPDES dischargers in the study area, LDEQ should develop a prioritization strategy for determining the need for additional permit requirements within each coastal basin. Through these actions, over the long term, it can be demonstrated that WLAs are being met.

LDEQ has identified mercury as one of its priorities. On June 2, 2006, it enacted the Louisiana Mercury Risk Reduction Act (Chapter 23 of Subtitle II of Title 30 of the *Louisiana Revised Statutes of 1950*, consisting of R.S. 30:2571 through 2588). It is LDEQ's intent to assess all sources of mercury to the environment in the state and to develop strategies to reduce public health risks associated with mercury. Prior to development of this act, a series of public meetings were held with participation from various industry sectors and non-governmental organizations. In addition, meetings on risk communication have been and continue to be conducted for enhancing public awareness of mercury and the risks of mercury exposure.

The approach of the Louisiana Mercury Reduction Act is intended to be exhaustive and comprehensive, looking at all sources of mercury along with methods of controlling releases to the environment. Action items include:

- Restrictions on the sale of certain mercury-added products
- Labeling of mercury-added products
- Disposal ban and proper management of mercury in scrap metal facilities
- Phase-out of nonessential mercury-containing devices
- Collection of mercury-added products
- Disclosure for mercury-containing formulated products used in health care facilities
- Limitations on the use of elemental mercury
- Existing inventories
- State procurement preference for non-mercury-added products
- Only limited use of mercury-added devices by water and wastewater systems
- Enhanced public outreach to educate the public on efforts that can be conducted locally and within the home to support the mercury reduction initiative

LDEQ continues its aggressive commitment to implementing a comprehensive statewide mercury program. The following excerpts from the LDEQ publication *Resource Guide to Understanding Mercury in Louisiana's Environment: 2003 Mercury Report* highlight some of the management strategies that continue to advance attainment of the reduction goals defined by these TMDLs (LDEQ 2003):

- Design and construction regulations for landfills help to ensure that mercury-laden materials do not leak from them.
- Historically, electrical switches in some natural gas meters contained mercury. Spills from such meters contaminated the ground and became sources of mercury to the environment. Since 1991 several natural gas pipeline companies, with oversight from LDEQ, voluntarily cleaned the mercury from the environment around contaminated natural gas meter sites. As of 2005 approximately 5,000 sites had been checked for mercury contamination and 2,500 that had been contaminated had been cleaned.
- Recycling played a large part in reducing not only the amount of mercury used by industries but also the amount released to the environment. LDEQ's Recycling Section maintains a current list of all recyclers in the state, sorted by commodity.

These TMDLs focus on the facilities likely to discharge mercury. Although every discharger has been assigned an individual WLA or is covered by the group WLA, EPA expects LDEQ to systematically identify any dischargers that are significant sources of mercury. EPA will work with LDEQ to establish mechanisms for demonstrating that these loads are being met. Mechanisms that could be used to demonstrate compliance include a certification process demonstrating that there are no known or suspected operations that could reasonably be expected to discharge mercury. Effluent sampling might be necessary for dischargers that cannot meet the certification requirement. Sampling requirements, if applicable, should include sampling and analysis using clean methods. EPA Method 1631, which has a detection limit of 0.0002 µg/L or 0.2 ng/L, is now available. In addition, EPA Method 1669 should be used for sampling guidance. Mercury monitoring to meet the requirements of this TMDL should follow the procedures

outlined in EPA Method 1631. With these additional data, EPA and LDEQ could consider the possibility of revising the TMDL at some point in the future if warranted.

5.4 Environmental Monitoring Activities

LDEQ uses funds provided under section 106 of the Clean Water Act and under the authority of the Louisiana Environmental Quality Act to run a program for monitoring the quality of the state's surface waters. The LDEQ Surveillance Section collects surface water samples at various locations, using appropriate sampling methods and procedures to ensure the quality of the data collected. The objectives of the surface water-monitoring program are to determine the quality of the state's surface waters, to develop a long-term database for water quality trend analysis, and to monitor the effectiveness of pollution controls. The data obtained through the surface water monitoring program are used to develop the state's biennial section 305(b) report (Water Quality Inventory) and section 303(d) list of impaired waters. This information is also used to establish priorities for LDEQ's nonpoint source program.

LDEQ has implemented a watershed approach to surface water quality monitoring. Through the approach, the entire state is sampled on a 4-year cycle. Long-term trend monitoring sites at various locations on the larger rivers and Lake Pontchartrain are sampled throughout the 4-year cycle. Sampling is conducted monthly to yield approximately 12 samples per site during each year the site is monitored. Sampling sites are located where they are considered representative of the waterbody. Under the current monitoring schedule, approximately one-half of the state's waters are newly assessed for section 305(b) and section 303(d) listing purposes during each biennial cycle, with sampling occurring statewide each year. The 4-year cycle follows an initial 5-year rotation that covered all basins in the state according to the TMDL priorities. Monitoring will allow LDEQ to determine whether there has been any improvement in water quality following TMDL implementation. As the monitoring results are evaluated at the end of each year, waterbodies might be added to or removed from the section 303(d) list of impaired waterbodies.

Over the past several years LDEQ has worked to expand its statewide mercury monitoring program. The primary objective of this program is to determine statewide mercury contamination levels of fish commonly eaten in Louisiana, as well as mercury concentrations in sediments, water, and epiphytic plant material and mercury loadings from aerial deposition. LDEQ adheres to well-defined sampling procedures when collecting mercury data. This program is an important tool for LDEQ in evaluating the progress of the mercury reductions prescribed by these TMDLs. LDEQ's targeted data collection efforts in subsegments with fish consumption advisories will provide the data necessary to ultimately remove the fish consumption advisory or revise the TMDL at some point in the future, if warranted. LDEQ has also implemented fish tissue and sediment monitoring. LDEQ periodically samples for mercury throughout the state at 400 sites. Areas that show elevated levels of mercury are sampled more frequently.

LDEQ's sampling site selection continues to evolve and is based on several needs. New sites are sampled to expand the number of waterbodies tested. Sites continue to be selected in basin subsegments in which no previous sampling occurred. Currently, nearly all waterbodies with fish populations sufficient to support human health risk assessment inputs have been sampled for mercury contamination. Waterbodies that are under an advisory for mercury are resampled

annually. Some waterbodies are resampled if LDHH determines that additional samples are needed to make a decision regarding fish consumption advisories. Continued fish tissue data collection provides input for analyses of risks to human health due to consumption of mercury-contaminated fish. This also allows LDHH and LDEQ to address public concerns regarding the safety of fish consumption from many waterbodies.

Epiphytic plant material is used to help further define the significance of atmospheric sources of mercury. Results of the epiphytic plant material analyses, together with fish tissue, water, and sediment concentration information, will continue to help address questions regarding sources of mercury. Additional local and statewide remedial actions can be more effectively targeted to reduce mercury sources by combining data generated from this and previous projects and the knowledge of LDEQ field personnel. This project will also provide baseline data that can be used for ongoing trend analysis.

Beginning in October 1998, LDEQ implemented an air monitoring program designed to assess the geographical extent and quantity of atmospheric mercury deposition. There are air monitors at the Southeastern University Campus in Hammond, Louisiana; at McNeese State University in Lake Charles, Louisiana; at the Louisiana State University in Chase, Louisiana; and in Alexandria, Louisiana, in Rapides Parish. Samples are tested for wet deposition of total mercury during rainfall events. If rainfall occurs, samples are collected weekly. In addition, LDEQ will be able to track progress with atmospheric deposition through the Mercury Deposition Network, which is part of the National Atmospheric Deposition Program (NADP). This program currently measures only wet deposition, but a working group has a goal to measure dry deposition as well. LDEQ operates and sponsors a site in Tangipahoa Parish, just to the west of the Pearl River Basin. The site has been collecting information since October 7, 1998. The objective of the Mercury Deposition Network (MDN) is to develop a national database of weekly concentrations of total mercury in precipitation and the seasonal and annual flux of total mercury in wet deposition. The data will be used to develop information on spatial and seasonal trends in mercury deposited to surface waters, forested watersheds, and other sensitive receptors. The MDN began as a transition network of 13 sites in 1995. Beginning in 1996, MDN became an official network in NADP with 26 sites in operation. Now more than 85 sites are in operation. The network uses standardized methods for collection and analysis. Three stations in Louisiana (Lake Charles, Chase, and Hammond) have provided weekly data since October 1998, while the Alexandria station began collecting data in February 2001. The data show that mercury levels are being regularly detected in rainwater. NADP staff members analyze the data, and any future reports concerning deposition data will be published by the NADP (National Atmospheric Deposition Program–Mercury Deposition Network, 2007).

5.5 TMDL Implementation Strategies

Reasonable assurance is needed so that the water quality criterion will be obtained. WLAs will be implemented through Louisiana Pollutant Discharge Elimination System (LPDES) permit procedures. Part of the LAs might be implemented through LDEQ's 305(b) program. Most of the nonpoint source mercury load addressed by the LA is likely from atmospheric deposition.

TMDL implementation for atmospheric deposition will differ from traditional TMDL implementation. The implementation plan will include different strategies and regulatory

controls, most likely on a national scale. Regulatory controls under the Clean Air Act (CAA) will assume that reductions in mercury emissions will reduce mercury loadings. Because air emissions regulations are implemented gradually, reductions are expected to take a number of years. Progress could be measured by mercury wet deposition concentrations and mercury concentrations in the water column, sediment, and fish tissue.

Implementation of the TMDL will follow current LDEQ policy, which is to assess dischargers for the reasonable potential to discharge mercury. Where reasonable potential exists or where effluent analyses demonstrate mercury at levels above 12 ng/L in the effluent, the LPDES permit will require the development of a mercury minimization program and/or a mercury limitation will be placed in the permit to ensure compliance with the TMDL.

The Clear Skies Initiative was first introduced in February 2002 but has not yet been enacted. This mandatory federal program would reduce emissions from power plants. Clear Skies would reduce mercury by 69 percent over 1999 levels and have a cap of 26 tons of emissions in 2010 and 15 tons in 2018 (USEPA 2007d). The initiative goes beyond the provisions of the Clean Air Act. The New Source Review (NSR) section of the Clean Air Act requires only that power plants and manufacturing facilities ensure that modifications to their plants do not increase emissions. The Clear Skies Initiative, on the other hand, would require them to improve their emissions (USEPA 2007d).

During implementation of these TMDLs, EPA expects the following activities to occur:

- NPDES dischargers will develop and implement mercury minimization plans, as appropriate.
- Air emissions of mercury will be reduced through implementation of the Clean Air Act regulation.
- LDEQ will collect additional ambient data on mercury concentrations in water, sediment, fish, and soil.
- LDEQ will develop and implement a mercury risk reduction plan that assesses all sources of mercury.

6 PUBLIC PARTICIPATION

Federal regulations require EPA to notify the public and seek comments concerning TMDLs that the Agency prepares. These TMDLs were developed under contract to EPA, and EPA held a public review period seeking comments, information, and data from the public and any other interested parties. The notice for the public review period was published in the *Federal Register* on XXX XX, XXXX, and the review period closed on XXX XX, XXXX.

Comments were received from XXX and were used to inform or revise this TMDL document. The comments and responses to these TMDLs will be included in a separate report, which will include comments on similar TMDLs with the same public review period.

EPA will submit the final TMDLs to LDEQ for implementation and incorporation into LDEQ's current water quality management plan.

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